

DAILY CHANGES IN AIR POLLUTION AND LUNG FUNCTION IN THE FRESNO ASTHMATIC CHILDREN'S ENVIRONMENT STUDY: USE OF INDIVIDUAL-LEVEL EXPOSURE ESTIMATES OF AIR POLLUTANT CONCENTRATIONS

Jennifer Mann, *UC Berkeley, School of Public Health, Berkeley, CA, USA*

Boriana Pratt, *UC Berkeley, School of Public Health, Berkeley, CA, USA*

Fred Lurmann, *Sonoma Technology, Inc., Petaluma, CA, USA*

Ira Tager, *UC Berkeley, School of Public Health, Berkeley, CA, USA*

Background/Aims: Exposure measurement error should be reduced when estimates of ambient air pollutant exposures account for spatiotemporal variations in concentrations and time/location/activity. We investigated the relationship of daily concentrations of nitrogen dioxide (NO₂), nitrate (NO₃), ozone, elemental carbon, PM_{2.5}, coarse fraction of PM₁₀, and both FEV₁ and FEF₂₅₋₇₅, in a cohort of 315 asthmatic children in Fresno, CA, followed from 2000 to 2008.

Methods: Pollutants were estimated using measurements at a USEPA supersite (SC) within 20 kilometers of all households. Individual estimates of daily ambient exposure (IEADE) were modeled based on concentrations at the supersite, measurements at schools and homes, and a time/location/activity sub-study. Pulmonary function was measured each morning with a programmable spirometer (EasyOne®, ndd, Zurich, Switzerland) for 14 days, up to 3 times a year. Effects of 0- to 7-day lags and 2- to 7 day moving averages for a change in interquartile range were investigated.

Results: After adjustment for height cubed, African American race and asthma diagnosis before the age of 2, NO₂ was the only pollutant associated with declines in pulmonary function (both FEV₁ and FEF₂₅₋₇₅), when SC were used to estimate exposure. However, with IEADE, both NO₂ and NO₃ were associated with decrements in FEF₂₅₋₇₅. NO₂ lag 1 was associated with a 43.2 ml/s decline in FEF₂₅₋₇₅ (95 CI=10.3-76.1 ml/s declines for a 12ppb increase) with SC and a 69.5 ml/s decline in FEF₂₅₋₇₅ IEADE (95% CI= 14.3 to 125 ml/s decline, 4.2 ppb increase). For NO₃ lag 1, declines increased from 9.2 to 107.3 ml/s with use of IEADE (95% CI=-23.2 to 4.8, for a 5.1 µg/m³ increase in SC and -14.3 to 125 ml/s for a 0.9 µg/m³ increase in IEADE respectively).

Conclusion: IIEADE were associated with greater impacts on pulmonary function in asthmatic children, possibly due to reduction of exposure measurement error.